REN21 is a global multi stakeholder network dedicated to the rapid uptake of renewable energy worldwide.

NGOs:
CAN, CEEW, FER, GACC, GFSE, Greenpeace International, ICLEI, ISEP, MFC, SLoCaT, REI, WCRE, WFC, WRI, WWF

Industry Associations:
ACORE, ALER, APREN, ARE, CREIA, CEC, EREF, GOGLA, GSC, GWEC, IGA, IHA, IREF, RES4MED, WBA, WWEA

Science & Academia:
Fundacion Bariloche, IIASA, ISES, NREL, SANEDI, TERI,

International Organisations:
ADB, APERC, ECREEE, EC, GEF, IEA, IRENA, RCREEE, UNDP, UNEP, UNIDO, World Bank

National Governments:
Afghanistan, Brazil, Denmark, Germany, India, Norway, South Africa, Spain, UAE, UK, USA
The report features:

- Global Overview
- Market & Industry Trends
- Distributed Renewable Energy for Energy Access
- Investment Flows
- Policy Landscape
- NEW: Enabling Technologies and Energy Systems Integration
- Energy Efficiency
- Feature: Deconstructing Baseload
REN21 Community

GSR Network:

- Over **800** active contributors and reviewers
- Tracking **155** countries
- Covering **96%** of global GDP
- Representing **96%** of global population
REN21 Renewables Interactive Map

- Research tool for tracking the development of renewable energy worldwide
- Complements perspectives and findings of REN21’s Global and Regional Status Reports with infographics and detailed, exportable data packs

www.ren21.net/map
176 countries had **renewable energy targets**, and renewable energy auctions were held in 34 countries in 2016 – more than double the year before.

**Newly installed renewable power capacity set new records** in 2016, with 161 gigawatts (GW) added, increasing the global total by almost 9% relative to 2015. Solar PV was the star performer in 2016, accounting for around 47% of the total additions, followed by wind power at 34% and hydropower at 15.5%.

For the fifth consecutive year, **investment in new renewable power capacity** was roughly **double the investment in fossil fuel generating capacity**, reaching USD 249.8 billion.

2016 was the **third year in a row where global energy related CO₂ emissions** from the energy sector remained stable despite a 3% growth in the global economy and an increased demand for energy.
Another extraordinary year for renewable energy

Total global capacity was up 9% compared to 2015, to more than 2,016 GW at year’s end (920 GW not including hydro)

Solar PV - 47% of newly installed renewable power capacity in 2016
Wind - 34%
Hydropower - 15.5%
As of 2015, renewable energy provided an estimated **19.3%** of global final energy consumption.
Renewable Energy in the World

Growth in Global Renewable Energy Compared to Total Final Energy Consumption, 2004-2014

# Renewable Energy “Champions”

## Top Five Countries - Annual Investment/Net Capacity Additions/Production in 2016

<table>
<thead>
<tr>
<th>Category</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment in renewable power and fuels (not including hydro &gt; 50 MW)</td>
<td>China</td>
<td>United States</td>
<td>United Kingdom</td>
<td>Japan</td>
<td>Germany</td>
</tr>
<tr>
<td>Investment in renewable power and fuels per unit GDP</td>
<td>Bolivia</td>
<td>Senegal</td>
<td>Jordan</td>
<td>Honduras</td>
<td>Iceland</td>
</tr>
<tr>
<td>Geothermal power capacity</td>
<td>Indonesia</td>
<td>Turkey</td>
<td>Kenya</td>
<td>Mexico</td>
<td>Japan</td>
</tr>
<tr>
<td>Hydropower capacity</td>
<td>China</td>
<td>Brazil</td>
<td>Ecuador</td>
<td>Ethiopia</td>
<td>Vietnam</td>
</tr>
<tr>
<td>Solar PV capacity</td>
<td>China</td>
<td>United States</td>
<td>Japan</td>
<td>India</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Concentrating solar thermal power (CSP) capacity</td>
<td>South Africa</td>
<td>China</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wind power capacity</td>
<td>China</td>
<td>United States</td>
<td>Germany</td>
<td>India</td>
<td>Brazil</td>
</tr>
<tr>
<td>Solar water heating capacity</td>
<td>China</td>
<td>Turkey</td>
<td>Brazil</td>
<td>India</td>
<td>United States</td>
</tr>
<tr>
<td>Biodiesel production</td>
<td>United States</td>
<td>Brazil</td>
<td>-</td>
<td>Argentina</td>
<td>Germany/Indonesia</td>
</tr>
<tr>
<td>Fuel ethanol production</td>
<td>United States</td>
<td>Brazil</td>
<td>China</td>
<td>Canada</td>
<td>Thailand</td>
</tr>
</tbody>
</table>
## Renewable Energy “Champions”

### Top Five Countries - Total Capacity or Generation as of End-2016

<table>
<thead>
<tr>
<th>POWER</th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable power (incl. hydro)</td>
<td>China</td>
<td>United States</td>
<td>Brazil</td>
<td>Germany</td>
<td>Canada</td>
</tr>
<tr>
<td>Renewable power (not incl. hydro)</td>
<td>China</td>
<td>United States</td>
<td>Germany</td>
<td>Japan</td>
<td>India</td>
</tr>
<tr>
<td>Renewable power capacity per capita (not including hydro)</td>
<td>Iceland</td>
<td>Denmark</td>
<td>Sweden/Germany</td>
<td></td>
<td>Spain/Finland</td>
</tr>
<tr>
<td>Bio-power generation</td>
<td>United States</td>
<td>China</td>
<td>Germany</td>
<td>Brazil</td>
<td>Japan</td>
</tr>
<tr>
<td>Geothermal power capacity</td>
<td>United States</td>
<td>Philippines</td>
<td>Indonesia</td>
<td>New Zealand</td>
<td>Mexico</td>
</tr>
<tr>
<td>Hydropower capacity</td>
<td>China</td>
<td>Brazil</td>
<td>United States</td>
<td>Canada</td>
<td>Russian Federat.</td>
</tr>
<tr>
<td>Hydropower generation</td>
<td>China</td>
<td>Brazil</td>
<td>Canada</td>
<td>United States</td>
<td>Russian Federat.</td>
</tr>
<tr>
<td>CSP capacity</td>
<td>Spain</td>
<td>United States</td>
<td>India</td>
<td>South Africa</td>
<td>Morocco</td>
</tr>
<tr>
<td>Solar PV capacity</td>
<td>China</td>
<td>Japan</td>
<td>Germany</td>
<td>United States</td>
<td>Italy</td>
</tr>
<tr>
<td>Solar PV capacity per capita</td>
<td>Germany</td>
<td>Japan</td>
<td>Italy</td>
<td>Belgium</td>
<td>Australia/Greece</td>
</tr>
<tr>
<td>Wind power capacity</td>
<td>China</td>
<td>United States</td>
<td>Germany</td>
<td>India</td>
<td>Spain</td>
</tr>
<tr>
<td>Wind power capacity per capita</td>
<td>Denmark</td>
<td>Sweden</td>
<td>Germany</td>
<td>Ireland</td>
<td>Portugal</td>
</tr>
</tbody>
</table>

### HEAT

<table>
<thead>
<tr>
<th>HEAT</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar water heating collector capacity</td>
<td>China</td>
<td>United States</td>
<td>Turkey</td>
<td>Germany</td>
<td>Brazil</td>
</tr>
<tr>
<td>Solar water heating collector capacity per capita</td>
<td>Barbados</td>
<td>Austria</td>
<td>Cyprus</td>
<td>Israel</td>
<td>Greece</td>
</tr>
<tr>
<td>Geothermal heat capacity</td>
<td>China</td>
<td>Turkey</td>
<td>Japan</td>
<td>Iceland</td>
<td>India</td>
</tr>
<tr>
<td>Geothermal heat capacity per capita</td>
<td>Iceland</td>
<td>New Zealand</td>
<td>Hungary</td>
<td>Turkey</td>
<td>Japan</td>
</tr>
</tbody>
</table>
Renewable Heating and Cooling

Modern renewable energy supplies approx. 9% of total global heat demand.

In 2016, the vast majority of renewable heat continued to be supplied by biomass, with smaller contributions from solar thermal and geothermal energy.

Deployment of renewable technologies in this market continued to be constrained by factors such as comparatively low fossil fuel prices and a relative lack of policy support.
176 countries had renewable energy targets
126 countries had power policies
68 countries had transport policies
21 countries had heating and cooling policies

Number of Renewable Energy Regulatory Incentives and Mandates, by Type, 2014-2016

Note: Figure does not show all policy types in use. In many cases countries have enacted additional fiscal incentives or public finance mechanisms to support renewable energy. Heating and cooling policies do not include renewable heat FITs (e.g., in the United Kingdom). Countries are considered to have policies when at least one national or state/provincial-level policy is in place. A country is counted a single time if it has one or more national and/or state/provincial-level policies. Some transport policies (include both biodiesel and ethanol) in this case, the policy is counted once in each category (biofuel and ethanol). Tendering policies are presented in a given year if a jurisdiction has held at least one tender during that year.

Source: REN21 Policy Database.
Most support for renewable heating and cooling was provided through financial incentives (grants, loans, rebates, tax incentives).
Carbon pricing policies were in place in 57 jurisdictions worldwide in 2016.
The renewable energy sector employed \textbf{9.8 million people} in 2016 - a \textbf{1.1\% increase} over 2015.

The chart illustrates the distribution of jobs in various renewable energy sectors. The total number of jobs in renewable energy is \textbf{8.3 million} in 2016, with an additional \textbf{1.5 million jobs} in the same year. The total number of jobs in 2015 was \textbf{9.8 million}.

Source: IRENA.
Global Investment in Renewable Energy


Note: Data include government and corporate R&D.

REN21 Renewables 2017 Global Status Report

Source: BNEF.
Global new investment in renewables was USD 241.6 billion in 2016. For the fifth consecutive year, investment in new renewable power capacity was roughly double that in fossil fuel capacity.
Biomass accounted for **14.1%** of total final energy consumption.
0.4 GW of new geothermal power generating capacity came online in 2016, bringing the global total to an estimated 13.5 GW.

Indonesia and Turkey were in the lead for new installations.
Concentrating Solar Thermal Power (CSP)

110 MW of capacity came online in 2016

Total global capacity: 4.8 GW

900 MW expected to enter operation during the course of 2017
Solar Thermal Heating and Cooling

Total capacity of water collectors increased by 5% to 456 GWth.

Solar heating and cooling technologies have been sold in at least 127 countries.

Renewables 2017 Global Status Report

Source: IEA SHC.
Top 5 countries for cumulative capacity were:

- China
- USA
- Turkey
- Germany
- Brazil

**Solar Thermal Heating and Cooling**

**China**
- 71%

**Other countries**
- Brazil: 2.0%
- India: 1.4%
- Australia: 1.4%
- Austria: 0.8%
- Israel: 0.7%
- Greece: 0.7%
- Italy: 0.7%
- Japan: 0.6%

**Source:** IEA SHC.
Solar Thermal Heating and Cooling

Gross additions: 36.7 GWth

Significant market growth in:

- Denmark: 84%
- Mexico: 6%
- India: 6%

REN21. Renewables 2017 Global Status Report
Residential sector accounted for 63% of total installed collector capacity at the end of 2015.

Markets transitioning to large-scale systems.
Enabling Technologies and Energy Systems Integration

Global **heat pump use** continues to increase

European heat pump market by end-2016:

- Installed capacity reached **73.6 GWth**
- Produced **148 TWh** of useful energy
Global primary energy intensity improved by **2.6%**

From 2010 to 2015, energy intensity declined by an average annual rate of **2.1%**

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**Energy Efficiency**

Global Primary Energy Intensity and Total Primary Energy Supply, 2010-2015

ENERGY INTENSITY is the ratio between the gross inland consumption of energy and GDP calculated for a calendar year.

Note: Dollars are at constant purchasing power parities.

[Source: REN21 Renewables 2017 Global Status Report]
By end-2016, at least 149 countries had enacted one or more energy efficiency targets.

Of these countries, 56 adopted a new target in 2015 or 2016.
By end-2016, at least 137 countries had enacted some kind of energy efficiency policy.

Of these countries, 48 enacted a new or revised policy in 2016.
Traditional baseload generators such as coal and nuclear are beginning to lose their economic advantage and may no longer be the first to dispatch energy.

A number of countries and regions – including Denmark, Germany, Uruguay and Cabo Verde – have integrated high shares (from 20-40%) of variable renewable energy.
Global renewable energy transition advancing with record capacity additions and rapidly falling costs – more capacity installed for less money

2016 was the third year in a row where decoupling of economic growth and energy-related CO₂ emissions occurred

However, progress not fast enough to reach Paris Agreement goals

Better-integrated sectoral planning

Smarter, more flexible systems integrating variable renewables

More use of enabling technologies
Renewable Energy Policy Network for the 21st Century